



tech bytes

AMES' EMERGING TECHNOLOGIES

Beating the Odds: Ames Success Stories

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Center Chief Technologist's Corner

As we begin a new year, I am pleased to present this edition of TechBytes, celebrating a number of successes at the Center.

First, we highlight some of the women at the Center who have received external recognition for their work. These female engineers were acknowledged by organizations whose paths, in some cases, rarely if ever cross NASA's. But someone outside NASA noted their talent, and their energy, and their efforts, and recognized them. Jessica Marquez won CNET's 20 Most Influential Latinos in Tech. Ali Guarneros-Luna was featured in BBC Mundo's "One Hundred Women" piece. Erika Rodriguez earned one of the Society of Women Engineer's Distinguished New Engineer Award (and followed that up with a 2017 NASA Trailblazer Award). They tell a little of their stories in this issue.

Other recognition came from within the Agency. We are very pleased to announce that Sarah D'Souza successfully faced off against 26 other highly capable teams from across the Agency to seize one of two Early Career Initiative awards given by the Space Technology Mission Directorate.

Fighting the odds does seem to be the recurring theme in this edition of TechBytes. Ali Guarneros-Luna urges people to persist, and I would like to echo that sentiment, particularly in the context of the Center Innovation Fund (CIF) and Center internal research and development (IRAD). While we cannot yet announce the final awardees, we have let many proposers know they didn't make the final cut. I would like to take this opportunity to strongly encourage researchers to continue to apply to these opportunities. Under the umbrella of the Space Technology Mission Directorate in particular, there are numerous opportunities to work on cutting edge technologies. Don't let a setback or two discourage you from pursuing innovative concepts. Innovation is the machine that keeps the Center – and the Agency – running.

Center IRAD is an especially welcome change to the way Ames does business. I applaud Center Management's willingness to bring back opportunities for the Center's innovators to obtain funding for more far-out ideas. Such forward thinking makes Ames a valuable contributor to the Agency.

Finally, I'd like to extend my best wishes to Ingrid Desilvestre (Program Executive, Office of the Center Chief Technologist) who has retired from employment with the Federal Government in December. Ms. Desilvestre has made many contributions to Ames Research Center and to NASA during her 30 years of Federal Government employment. She first came to the NASA family through a Presidential Management Fellowship and jumped right into her very first NASA job as the Soviet desk offices, just as the US-Soviet space collaboration was resuming in the late 1980's. From there she became a desk officer for Germany, Norway, Canada, Latin America and Japan, and finally, the NASA Representative in Spain, looking out for NASA interests with respect to the Madrid Deep Space Tracking station. Ms. Desilvestre was responsible for getting the government-to-government agreement for the tracking station signed, after years of temporary extension. Moving onward and upward, she moved to Ames Research Center to serve as the Special Executive to the Center Director, and made her last contribution to NASA as the Program Executive to the Office of the Chief Technologist. Our office will miss her greatly, and we wish her all the best wherever her adventures in retirement might take her. Congratulations Ingrid!

*Sincerely,
Harry Partridge
NASA Ames Center Chief Technologist*

ABOUT THE COVER

Pictured are Ames award winners (left) Ali Guarneros-Luna and (right) Jessica Marquez.

Author Ingrid Desilvestre's (center) Argentine-born mother also commanded her to get an education, saying no one could take it away.

On Overcoming Challenges: Ali Guarneros Luna

- Ingrid Desilvestre



Ali Guarneros-Luna. Image Credit: NASA Ames

British Broadcasting Corporation (BBC) Mundo highlighted the successes, in the face of great challenges, of 100 women. One of them was Ames' own Ali Guarneros-Luna. The BBC article focused on the fact that she declared she would become an aerospace engineer when she was only 7 – and succeeded, despite several significant challenges.

She excelled in part because her mother, who was never even able to complete high school, placed enormous value on learning and inculcated that in her daughter. She succeeded despite the traumatic experience of the devastating Mexico City earthquake of 1985. She succeeded despite moving to another country, and being asked to work to help support the family at 18, which forced her studies to the back burner. And she succeeded despite the responsibilities that came with children of her own.

Getting to NASA

Guarneros-Luna said, "I knew that having a career would let me give (the children) stability and a better life. That motivated me." So she signed up for classes at San Jose State. She seized the opportunity to do an internship at NASA Ames, and has been here ever since. From the internship, she moved to become a contractor, and finally converted to civil servant.

Guarneros-Luna started her NASA career supporting the Synchronized Position Hold Engage and Reorient Experimental Satellite (SPHERES), followed by the Nanosatellite Launch Adapter System (NLAS) and the Network & Operation Demonstration Satellite (NODeS). But then she joined the team working on the first Technology Educational Satellite (TechEdSat) under the direction of former Ames Chief Technologist John Hines, and has been involved in TechEdSat ever since.

She has done a broad range of quality and mission assurance and other work for Ames, but her passion is for TechEdSat and its related projects – and for bringing young women into aerospace.

Silicon Valley (and NASA) Should Be the Paradigm

Guarneros-Luna observes that Hispanic and black women make up a minority of the workforce in all areas, and are even more poorly represented in science and engineering. She still goes to meetings where she's the only technical woman in the room. She wants to inspire women to pursue careers in aerospace and break barriers. She thinks Silicon Valley should be cutting edge in aerospace as well as technology. She wants to "make it the norm for women to work side-by-side with men." TechEdSat walks the talk: not only are the TechEdSat CubeSats largely built by students, but half the interns working on TechEdSat this year were women.

Maintaining Rigor

The interns learn valuable career skills as a result of their work on the CubeSats. Guarneros-Luna laughs when asked if benefits flowed the other way as well. "Interns," she says, "come up with innovative solutions we never thought of – they're not limited by their NASA experience." Some, she emphasizes, contribute out-of-the-box solutions even when they're not engineers. The kids "provide fresh ideas."

The eagerness to consider innovative approaches is a hallmark of the entire TechEd-



On Overcoming Challenges: Ali Guarneros Luna (continued)

Sat project, but at the same time, the program refuses to sacrifice rigor. "We build on what we've already done. TechEdSat 1 broke ground in establishing the rules for small payloads on the International Space Station (ISS). (Each successive mission) built on that, focusing on what was different." In other words, each TechEdSat iteration remains fundamentally the same, but incorporates some new technology or capability. The team doesn't alter the flight-proven hardware, which has already undergone meticulous review in order to even be considered for the ISS, but develops and thoroughly tests the new elements. It helps that these novel elements have invariably already been tested, first on balloons and then on sub-orbital missions, and only then incorporated in a CubeSat slated for launch from the ISS. The process systematically and rigorously builds flight heritage. She hopes NASA will support the TechEdSat and develop more new technologies at low cost.

Relevance of TechEdSat for Ames and NASA

In fact, Guarneros-Luna believes the TechEdSat model is highly relevant to NASA.

"TechEdSat is a smallsat you can put in a human-rated spacecraft, build fast and at low cost, but safely." The same model of developing and building technologies, and testing and maturing them – all done quickly, safely, and at a low cost – is, she is convinced, appli-

cable to Mars and other NASA missions. It's efficient, inexpensive, and highly responsive – she notes that TechEdSat 6 was built in only 6 weeks in response to an unexpected opportunity to launch to ISS (it was launched in November).

The biggest challenge, she sighs, is bureaucracy.

Accomplishments

Guarneros-Luna is proud of her work at NASA, particularly the smallsat work. She is particularly proud that she was part of the trailblazing team that built the first U.S. satellite ever to launch from ISS. The experience informed the ISS process with respect to CubeSats. She also takes pride in the technologies that successive TechEdSat CubeSats developed, including a wireless sensor, WiFi at 350 kilometers, a deorbiting mechanism, and the radio-frequency identification tag (RFID) being test even now on TechEdSat 6. A future iteration might incorporate a virtual reality element for the first time that could eventually be used to assess and repair satellites.

She returns full circle to the maternal encouragement that helped launch her on her NASA career. "Do not let circumstances define you," she says. "You define your path. There are circumstances beyond your control. You have to overcome them. Be persistent!" ■

CONTACT

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Glidepath to Aerospace - Ingrid Desilvestre

Jessica Marquez was not born in the USA, or into a family of aerospace engineers, and she didn't go to a school named after an astronaut. But it seems she was still on a glidepath to a career in aerospace, and in fact she considers that path the ideal model for anyone interested in such a career.

Born in Peru to an American mother and a Peruvian father, she was interested from early childhood in spaceflight. This interest

guided her life's path, first to an internship with the NASA Academy at Ames in 1998 while she was pursuing an undergraduate degree at Princeton University.



Jessica Marquez. Image Credit: NASA Ames

Glidepath to Aerospace (continued)

That first exposure to Ames inspired her to take the next stage of her journey, a graduate program in the Massachusetts Institute of Technology's (MIT) Man Vehicle Lab. At MIT, she specialized in decision-support systems for lunar and planetary exploration. She received a master's degree in aeronautics and astronautics and later a Ph.D. in human systems engineering.

The NASA Academy, she says, was a great experience. It was her first exposure to research, and gave her a lot of insight into the Agency and aerospace in general. "It opened my eyes to the possibility of grad school, and taught me how to implement collaborations," along with many other intangibles.

At MIT, much of her work was funded by NASA, either through grants to principal investigators (PIs) there or fellowships of her own. Her adviser was none other than Dava Newman, the former NASA Deputy Administrator, and former astronaut Jeff Hoffman served on her thesis committee.

Those experiences ultimately brought her back to Ames, where she has just celebrated her 10th anniversary at NASA. Today, Marquez is a research engineer in the Human System Integration Division at Ames. As a researcher, she develops tools for people who support human space exploration, including trainers, flight controllers, and astronauts.

She believes her path reflects an ideal because she believes that NASA has a unique role to play in terms of engaging with and inspiring young people to study science and engineering, and ultimately reward the most talented of them with jobs that in turn contribute to the Agency. At the same time, she acknowledges that she may not be typical in her outlook: "Young people are not into long-term careers, but I'm old-school that way." For better or worse, she sees herself involved in space her entire career.

In fact, she applied to join the astronaut corps, and got as far as an interview. She

thinks her timing may be unfortunate: she started applying after NASA was regularly accepting large classes to crew the Space Shuttle and International Space Station (ISS), but before NASA begins to recruit astronauts for missions to the Moon and Mars.

She consoles herself with the knowledge that she is still fulfilling her life-long goal of making a "material contribution" to human spaceflight. "It's gratifying to sit next to someone (at Mission Control) who is using our product," she says of an Ames-developed planning and scheduling software tool. She's thrilled that an Ames prototype web version of a timeline tool has been deployed to the ISS – "a little piece of us is in space!" she exclaims proudly. She hopes that Ames' experience with autonomy will open more doors for the Center to contribute to human spaceflight in the future.

Her career has brought her other rewards. Last year, she was invited to give a talk at an Academy of Sciences Frontier Symposium in Abu Dhabi. The symposia are designed to bring together people who normally would not meet, in order to encourage interactions and exchanges of ideas.

She was impressed by Abu Dhabi's deep investment in education, which reflects the nation's understanding that they can't depend on oil forever, but need to develop new industries and partnerships. The result is an investment in infrastructure, equipment, laboratories – and space. Abu Dhabi not only has a space program, but an ambitious one: they are aiming to go to Mars.

She was also pleased that the educational emphasis embraces girls. In fact, she observed, the head of the space agency is a woman. That reminded her of the fact that her mother always encouraged her to pursue her education – "No one can take it away from you," her mother said.

More recently, CNET named her to CNET's 20 Most Influential Latinos in Tech (<https://www.cnet.com/news/cnet-en-espanol-the->



Glidepath to Aerospace (continued)

20-most-influential-latinos-in-tech-2017/). To date, she does not know how or who nominated her for this accolade.

The glidepath was direct, but not always smooth. Coming to NASA was in some ways a challenge, she says. Her Ph.D. colleagues often ended up in academia or other positions where they start at higher salaries and opportunities to pursue their research in well-equipped labs. NASA doesn't seem to be able to facilitate that type of experience

anymore. Establishing collaborative relationships requires effort, and the infrastructure doesn't always exist. But teams are useful in terms of exchanging, vetting, and challenging ideas, thereby improving them in a way that is difficult working in isolation.

The other big challenge, she says with a smile, is bureaucracy.

That one might not be as easy to address. ■

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Inspiring the Next Generation - Ingrid Desilvestre

It isn't NASA's mission statement, but it's almost always part of the NASA elevator pitch: inspiring the next generation. Few do it as conscientiously as Erika Rodriguez, who just received the Distinguished New Engineer Award from the Society of Women Engineers (SWE). Her passion for learning and developing cutting-edge concepts is noteworthy, and she transfers this passion by mentoring students so that they too obtain a zeal for engineering," her nomination explains. "She embodies the SWE objective to 'Encourage women engineers to attain high levels of education and professional achievement.'"

As TechBytes went to print, we learned that Rodriguez had also received the 2017 NASA Trailblazer Award. The award is presented to NASA and NASA contractor employees in any field supporting human space flight during the first seven years of their career, who demonstrate notable creativity and a strong work ethic.

NASA lured Rodriguez away from a job opportunity at Wright Patterson Air Force Base. She relished the opportunity, not least because it allowed her to return to California after too many years battling snow and cold in Syracuse, New York, where she earned her masters and Ph.D. in Mechanical and Aeronautical Engineer-

ing with a specialty in Materials Science.

Rodriguez is enthusiastic about her work testing hardware and thermal protection systems (TPS) materials for NASA's Orion Multi-Purpose Crew Vehicle (MPCV); but she appreciates the SWE award because it

helps promote her labor of love, i.e., her efforts to bring in the next generation of female engineers. Recently her efforts have focused on attracting students from top-notch women's colleges to the Agency.

If she could give the young engineers one piece of advice, it's to be adaptable and patient. She would also advise them to learn to abide by regulations and be aware of the informal as well as the formal rules – yet find ways to solve problems and get things done. She deplores the fact that many sophomores abandon engineering. They should know, she says, that they're not alone, that there's a lot of support for them in the engineering community should they need it. ■

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Erika Rodriguez. Image Credit: NASA Ames

NASA Ames Research Center Investigator selected for Early Career Initiative (ECI) program - Ingrid Desilvestre

NASA has selected two teams of Agency technologists for participation in the Early Career Initiative (ECI) program. One went to Ames for the “Autonomous Guidance and Control System for Deployable Entry Vehicles,” led by Dr. Sarah D’Souza, principal investigator at NASA’s Ames Research Center in Silicon Valley. The external partners are the University of California at Davis for vehicle system design and entry aerodynamic and aeroheating; and Johns Hopkins University Applied Physics Laboratory for systems engineering and requirements development.

NASA’s Space Technology Mission Directorate (STMD) created the ECI to enable a highly collaborative work environment between the best and brightest NASA early-career and leading innovators in industry, academia and other government organizations. The ECI program gives early-career employees an opportunity to propose and lead a project from beginning to end. It encourages creativity and innovation among early-career NASA technologists by engaging them in hands-on technology development opportunities needed for future missions. In addition, each project must adopt a project management methodology that has been successful in other industries or organizations, and can be explored as an alternative method of managing technology development projects within NASA. Each project must engage a highly qualified external partner that brings an element of technical or programmatic excellence and innovation to the project.

““This program provides exposure to alternative project management approaches,” said Ricky Howard, STMD’s Center STMD’s ECI manager. “It allows early-career employ-



Sarah D’Souza (right back) and her ECI team (clockwise from right front): Tracie Conn, Wendy Okolo, Brandon Smith, and Ben Nikaido. Image credit: NASA Ames

ees experience outside of NASA’s standard management approach, and it will help STMD identify project management approaches that work better for technology development work.”

The other team selected for the ECI program is “Orbital Syngas/Commodity Augmentation Reactor (OSCAR),” led by Anne Meier, principal investigator, at NASA’s Kennedy Space Center, and external partner Blue Origin of Kent, Washington, for experiment consulting, design and fabrication work, and a suborbital test flight. ■



NASA Ames Research Center Investigator selected for Early Career Initiative (ECI) program

Dr. D'Souza (Code AA) is proud of her team. "We are honored to have been awarded this ECI opportunity by STMD. During the proposal process our passionate team of NASA Early Career employees developed an idea to achieve a technology breakthrough in Control Systems for precision landing of Deployable Entry Vehicles on Mars. We are so

excited to be leveraging key NASA technologies, increasing our engineering versatility for NASA, and growing our project management and prototyping skills! The next two years are going to be fun and wild ride as we build this system!" ■

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Upcoming Activities & Events

January 2017 – April 2018

NASA Solicitations

Space Technology Mission Directorate

Utilizing Public-Private Partnerships to Advance Tipping Point Technologies
<https://nspires.nasaprs.com/external/solicitations/summary/init.do?sollid=%7b2526CB35-BBC9-BE00-E54A-F965B85401FE%7d>
 Mandatory Preliminary Proposals

Due: January 30, 2018 (5:00pm Eastern)

Invited Full Proposal

Due: May 30, 2018 (5:00pm Eastern)
 (target)

APPEL Courses Held Around the Agency

Course: APPEL-Foundations of Aerospace at NASA (LaRC)

Dates: February 12-14, 2018

Registration Open

Registration Deadline: January 29, 2018

Course: APPEL-Introduction to PM at NASA (ARC)

Dates: February 26-28, 2018

Registration Open

Registration Deadline: February 12, 2018

For more information on APPEL visit
<https://appel.nasa.gov>

External Solicitations

Defense Advanced Research Projects Agency (DARPA)

Advanced Plant Technologies (APT)
 Solicitation Number: HR001118S0005

The goal of the DARPA Advanced Plant Technologies (APT) program is to create the foundations for engineering plant varieties able to receive a variety of stimuli and produce measurable signals as output ("stimulus-response"). APT will rigorously explore the feasibility of using engineered plant varieties as independent biosensors.

Response Date: February 21, 2018

Events & Conferences

SmallSat Symposium

February 5-8, 2018

Mountain View, California
<https://smallsatshow.com>

IEEE Aerospace Conference

March 4-11, 2018

Big Sky, Montana
<https://www.aeroconf.org>

Materials Research Society

April 2-6, 2018

Spring Meeting & Exhibit
 Phoenix, Arizona
<http://www.mrs.org/spring2018>